
पुनर्रचित रबड़ — विशिष्टि
(दूसरा पुनरीक्षण)

Reclaimed Rubber — Specification
(*Second Revision*)

ICS 83.060

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FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Rubber and Rubber Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

This standard was first published in 1974 and subsequently revised in 1997. In the first revision, the requirements for mooney viscosity (ML 1+8) and chloroform extract were added. Keeping in view the raw materials used and quality of reclaimed rubber, reclaimed rubber were classified into the following three classes, namely WTR-R - Whole tyre reclaimed rubber, TRR-N- Tube reclaimed rubber - Natural rubber and TRR-I - Tube reclaimed rubber - Isobutylene isoprene rubber (Butyl Rubber).

Reclaimed rubber is extensively used in the manufacture of many rubber goods both in tyre and non-tyre sectors except in some compounds for tyres. This reclaim is used either alone or in combination with natural and synthetic rubber or as blend of these polymers. Now-a-days high tensile NR and butyl reclaim are also manufactured and used. Thus, reclaim rubber having different qualities are now available in the market for different applications.

Reclaimed rubber is a recycled product produced from the End of Life Tyre (ELT), Tyre, Tubes, moulded products etc. and is used at an acceptable dosage in the compound depends on the end product applications. The positive impact on the environment of reclaimed rubber includes reducing and discouraging illegal disposal of ELT in Landfills or other disposal sites where the ELT leachates might harm the environment. Reclaimed rubber proportionately reduces and conserve the quantum of use of rubber or additive and help to preserve the natural resources.

Based on the current trade practices, quality requirements and latest technologies available, the committee decided to upgrade the standard. In this second revision, the major changes are:

- a) four new class WTR-C, WTR-LM, HTT-R and EPDM-R have been included;
- b) requirements of total organic content, calcium carbonate, heavy metals and substances and polycyclic-aromatic hydrocarbons (PAH) have been incorporated;
- c) requirements for mooney viscosity (ML 1+8) and chloroform extract have been removed; and
- d) values of requirements of acetone extract, ash content, carbon black, rubber hydrocarbon, relative density, mooney viscosity, tensile strength and elongation at break have been modified for the existing classes.

Determination of polycyclic-aromatic hydrocarbons (PAH) in recycled rubber will help in containing their effect on human health and environment impact. PAHs like Benzo(a) pyrene (BaP)(CAS No. 50-32-8), b) Benzo(e) pyrene (BeP) (CAS No. 192-97-2), Benzo(a)anthracene (BaA) (CAS No. 56-55-3), Chrysene (CHR) (CAS No. 218-01-9), Benzo(b) fluoranthene (BbFA) (CAS No. 205- 99-2), Benzo(j) fluoranthene (BjFA) (CAS No. 205-82-3), Benzo(k) fluoranthene (BkFA) (CAS No. 207-08-9) and Dibenzo(a, h) anthracene (DBaH) (CAS No 53-70-3) are therefore included.

The composition of the Committee responsible for formulation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

RECLAIMED RUBBER — SPECIFICATION

(*Second Revision*)

1 SCOPE

This standard prescribes the requirements and method of sampling and test for seven different classes of reclaimed rubber.

2 REFERENCES

The standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreement based on standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

3 CLASSES

The reclaimed rubber shall be classified as given

below according to the raw material used and the quality of the reclaimed rubber.

4 REQUIREMENTS**4.1 Description**

Smoothly refined reclaimed rubbers are to be available either in sheet form or extruded profile in the form of a rod. That material shall be dusted to avoid sicking with each other. The reclaimed rubber shall be free from any metal piece.

4.2 Requirements

The material shall comply with the requirements given in Table 1. when tested as prescribed in col (10) of Table 1.

<i>Sl No.</i>	<i>Classification</i>	<i>Abbreviated</i>	<i>Material</i>
(1)	(2)	(3)	(4)
i)	Whole tyre rubber reclaimed	WTR-R	End-of-Life Tyre (ELT) rubber from automobiles such as truck, bus and passenger car, etc.
ii)	Whole tyre rubber reclaimed - coarse finish	WTR-C	End-of-Life Tyre (ELT) rubber from automobiles such as truck, bus and passenger car, etc.
iii)	Whole tyre rubber reclaimed - low mooney	WTR-LM	End-of-Life Tyre (ELT) rubber from automobiles such as truck, bus and passenger car, etc.
iv)	High tensile tread reclaimed rubber	HTT-R	Tyre tread rubber (tread peeling) from automobile such as truck, bus, etc.
v)	Tube reclaimed rubber - natural rubber (NR)	TRR-N	Rubber from tyre tubes principally made of natural rubber
vi)	Tube reclaimed rubber – isobutylene -isoprene rubber (IIR)	TRR-I	Rubber of tyre tubes principal made of isobutylene - isoprene rubber
vii)	EPDM reclaimed rubber - ethylene propylene diene monomer (EPDM)	EPDM-R	Rubber of scrap profiles/other products principal made of ethylene propylene diene monomer rubber

5 PACKING AND MARKING

5.1 Packing

5.1.1 The reclaimed sheets shall be packed in 25 kg or 50 kg bales.

5.1.2 The material shall be wrapped suitably as agreed to between the purchaser and the supplier.

5.2 Marking

5.2.1 Each bale of reclaimed rubber shall be marked with the following information:

- a) Class of reclaimed rubber;
- b) Net mass of bale;
- c) Name of the manufacturer or its trade-mark;
- d) Batch number;
- e) Month and year of production; and

f) Any other statutory requirements.

5.2.2 TRR-I bales shall be identified with blue strip to avoid any mix up with WTR-R, WTR-C, WTR-LM, HTT-R, TRR-N or EPDM-R.

5.2.3 *BIS Certification Marking*

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the products may be marked with the standard mark.

6 SAMPLING

For the purpose of ascertaining the conformity of the reclaimed rubber in a consignment to this specification. The scale of sampling and criteria for conformity shall be as prescribed in IS 5599.

Table 1 Requirements for Reclaimed Rubber

IS 7490 : 2023

(Clause 4.2)

SI No.	Characteristic	Requirement							Methods of Test, Ref To
		WTR-R	WTR-C	WTR-LM	HTT-R	TRR-N	TRR-I	EPDM-R	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	Volatile matter, percent by mass, <i>Max</i>	1.0	1.0	1.0	1.0	1.0	1.0	1.0	RR : 1 of IS 6306
ii)	Acetone extract, percent by mass, <i>Max</i>	16.6	16.6	16.6	16.6	15	12	35	RR : 4 of IS 6306
iii)	Ash content, percent by mass, <i>Max</i>	9	9	9	9	28	7	20	RR : 3 of IS 6306
iv)	Carbon black, percent by mass	27 ± 3	27 ± 3	27 ± 3	28 ± 3	20 ± 5	32 ± 4	28 ± 4	RR : 5 of IS 6306
v)	Rubber hydrocarbon, percent by mass, <i>Min</i>	47	46	48	48	42	50	25	RR : 6 of IS 6306
vi)	Relative density	1.14 ± 0.02	1.14 ± 0.02	1.14 ± 0.02	1.13 ± 0.03	1.25 ± 0.05	1.14 ± 0.02	1.20, <i>Max</i>	RR : 2 of IS 6306
vii)	Mooney viscosity ML (1 + 4) at 100 °C	40 ± 10	50 ± 10	20 ± 35	50 ± 10	35 ± 10	37 ± 8	35 ± 10	RR : 7 of IS 6306
viii)	Tensile strength, N/mm ² , <i>Min</i>	4	3.5	4	7.5	3.5	7.5	6	RR : 8 of IS 6306
ix)	Elongation at break, percent, <i>Min</i>	200	150	200	250	200	480	275	RR : 8 of IS 6306 with modifications given in Annex B
x)	Total organic content, percent	65 ± 5	65 ± 5	65 ± 5	65 ± 5	55 ± 5	60 ± 5	—	ISO 9924-1
xi)	Calcium carbonate, percent	4 ± 1	4 ± 1	4 ± 1	2 ± 1	10 ± 2	4 ± 1	—	ISO 9924-1
xii)	Heavy metals and substances, <i>Max</i> , percent by weight	—	—	—	—	—	—	—	—
	a) Lead	—	—		0.1			—	IS 16197 (Part 5)
	b) Mercury	—	—		0.1			—	IS 16197 (Part 4)

Table 1 (Concluded)

SI No.	Characteristic	Requirement							Methods of Test, Ref To
		WTR-R	WTR-C	WTR-LM	HTT-R	TRR-N	TRR-I	EPDM-R	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	c) Cadmium	—	—		0.01			—	IS 16197 (Part 5)
	d) Hexavalent chromium	—	—		0.1			—	IS 16197 (Part 7/ Sec 2)
	e) Polybrominated biphenyls(PBB)	—	—		0.1			—	IS 16197 (Part 6)
	f) Polybrominated diphenyl ethers (PBDE)	—	—		0.1			—	IS 16197 (Part 6)
xiii)	Polycyclic aromatic hydrocarbons (PAH)	—	—			—		—	EN 16143 ¹⁾
	a) Benzo(a)pyrene (BaP)	—	—		< 1 mg/ Kg			—	—
	b) Sum of the Benzo(e)pyren (BeP), Benzo(a)anthracene (BaA), Chrysen (CHR), Benzo(b)fluoranthene (BbFA), Benzo(j)fluoranthene (BjFA), Benzo(k)fluoranthene (BkFA), Dibenzo(a, h)anthracene (DBAhA)	—	—		< 10 mg/ Kg			—	—

¹⁾ EN 16143 test method to be used till corresponding IS test method is developed.

ANNEX A

(Clause 2)

LIST OF REFERRED STANDARDS

<i>IS No./Other Publications</i>	<i>Title</i>	<i>IS No./Other Publications</i>	<i>Title</i>
IS 1675 : 1971	Specification for stearic acid, technical (<i>first revision</i>)	(Part 6) : 2018/ IEC 62321-6 : 2015	Polybrominated biphenyls and polybrominated diphenyl ethers in polymers by gas chromatography — Mass spectrometry (GC-MS)
IS 3399 : 2013	Zinc oxide for rubber industry — Specification (<i>third revision</i>)	(Part 7/Sec 2) : 2020/IEC 62321- 7-2 : 2017	Hexavalent chromium, Section 2 Determination of hexavalent chromium (Cr(VI)) in polymers and electronics by colorimetric method
IS 5599 : 1999	Rubber — Raw, natural and synthetic — Methods for sampling and sample preparation (<i>first revision</i>)	ISO 9924-1 : 2023	Rubber and rubber products — Determination of the composition of vulcanizates and uncured compounds by thermogravimetry — Part 1: Butadiene, ethylene-propylene copolymer and terpolymer, isobutene-isoprene, isoprene and styrene-butadiene rubbers
IS 6306 : 1971	Methods of test for reclaimed rubber		
IS 6918 : 2002	Mercaptobenzothiazole — Specification (<i>first revision</i>)		
IS 8851 : 1994	Sulphur for rubber industry — Specification (<i>first revision</i>)		
IS 8979 : 1997	Tetramethyl thiuram disulphide — Specification (<i>second revision</i>)	EN 16143 : 2013	Petroleum products — Determination of content of Benzo(a) pyrene (BaP) and selected polycyclic aromatic hydrocarbons (PAH) in extender oils — Procedure using double LC cleaning and GC/MS analysis
IS 16197	Determination of certain substances in electrotechnical products:		
(Part 4) : 2014/ IEC 62321-4 : 2013	Mercury in polymers, metals and electronics by CV-AAS, CV-AFS, ICP-OES and ICP-MS		
(Part 5) : 2014/ IEC 62321-5 : 2013	Cadmium, lead and chromium in polymers and electronics and cadmium and lead in metals by AAS, AFS, ICP-OES and ICP-MS		

ANNEX B

[Table 1, Sl No. (viii) and (ix)]

TEST RECIPE FOR COMPOUNDING OF RECLAIMED RUBBER FOR TEST OF PHYSICAL PROPERTIES

A-1 GENERAL

A-1.1 Compounding of reclaimed rubber for testing of physical properties shall be carried out as per RR : 8 of IS 6306.

reclaimed rubber for testing of physical properties the following composition of the mix shall be taken in the test recipe (in place of that as given in **4.1** of RR : 8 of IS 6306 for each of class of reclaimed rubber) as indicated against each:

A-1.2 However, for carrying out compounding of

a) <i>For WTR-R, WTR-C, WTR-LM, HTT-R and TRR-N</i>	<i>Parts Per Hundred Parts of Rubber (phr)</i>
Curing condition: 140 °C for 20 min	
Reclaimed rubber	100.00
	(as rubber hydrocarbon)
Stearic acid (<i>see</i> Grade 3 of IS 1675)	2.00
Zinc oxide (conforming to IS 3399)	5.00
Mercaptobenzothiazole (<i>see</i> IS 6918)	0.50
Diphenyl guanidine (rubber grade)	0.20
Sulphur (<i>see</i> IS 8851)	3.00
b) <i>For TRR-I</i>	
Curing condition: 160 °C for 30 minutes	
Reclaimed rubber	100.00
	(as rubber hydrocarbon)
Zinc oxide (<i>see</i> IS 3399)	5.00
Tetramethyl thiuram disulfide (TMTD) ¹⁾ (<i>see</i> IS 8979)	1.00
Mercaptobenzothiazole (MBT) (<i>see</i> IS 6918)	0.50
Sulphur (<i>see</i> IS 8851)	2.00
c) <i>For EPDM</i>	
Curing condition: 160 °C for 20 minutes	
Reclaimed rubber	100.00
	(as rubber hydrocarbon)
Zinc oxide (conforming to IS 3399)	5.00
Tetramethyl thiuram disulfide (TMTD) ¹⁾ (<i>see</i> IS 8979)	1.00
Mercaptobenzothiazole (MBT) (<i>see</i> IS 6918)	0.50
Sulphur (<i>see</i> IS 8851)	2.00
Stearic acid (<i>see</i> Grade 3 of IS 1675)	1.00

¹⁾In the case of restriction of TMTD usage due to environmental impact, zinc dibenzylthiocarbamate (ZBEC) to be used at 1.5 phr. At that time, MBT dosage should be 1.0 phr. No change in other ingredients dosages.

ANNEX C

(Foreword)

COMMITTEE COMPOSITION

Rubber and Rubber Products Sectional Committee, PCD 13

<i>Organization</i>	<i>Representative(s)</i>
Rubber Research Institute of India, Rubber Board, Kottayam	DR SIBY VARGHESE (Chairperson)
All India Rubber Industries Association, Mumbai	SHRI SRIKANTH KRISHNAMURTHY SHRI CHINMOY RAY (<i>Alternate</i>)
Apcotex Industries Limited, Mumbai	DR S. V. GOVINDRAJU
Association of Latex Producers of India, Kottayam	SHRI SATISH ABRAHAM
Association of Planters of Kerala, Thiruvananthapuram	SHRI PHILIP C. JACOB
Automotive Tyres Manufacturers Association (ATMA), New Delhi	SHRI RAJIV BUDHRAJA SHRI NITEESH K. SHUKLA (<i>Alternate</i>)
Block Rubber Processors Association of India, Mumbai	SHRI RAJIV THARIAN SHRI RONNY JOSEPH (<i>Alternate</i>)
Directorate General of Quality Assurance (DGQA), Ministry of Defence, New Delhi	SHRI S. K. SAXENA SHRI V. K. CHHABRA (<i>Alternate</i>)
Dow Corning India Pvt Ltd, Mumbai	SHRI SUBHRANSHU GUPTA
Flame Retardants Association of India, Gurugram	SHRI P. V. MURALI MOHAN
GRP Limited, Mumbai	SHRI KALYAN DAS SHRI K. M. RAVI (<i>Alternate</i>)
HASETRI, Mysuru	DR SAIKAT DAS GUPTA
Indian Oil Corporation R&D Centre, Faridabad	DR DEEPAK SAXENA DR PANKAJ BHATNAGAR (<i>Alternate</i>)
Indian Rubber Manufacturers Research Association (IMRA), Mumbai	DR K. RAJKUMAR DR BHARAT KAPGATE (<i>Alternate</i>)
Indian Synthetic Rubber Private Limited (ISRPL), Noida	SHRI LALIT KUMAR SHARMA SHRI BHANU PRATAP SINGH (<i>Alternate I</i>) SHRI TUHIN KANTI DAS (<i>Alternate II</i>)
KA Prevulcanized, Nagercoil	SHRI PRAVEEN MATHEW
LANXESS India Private Limited, Kolkata	SHRI ARINDAM GHOSH
LPG Equipment Research Centre, Bangaluru	SHRI SANTOSH K. GUPTA SHRI ASHIS KUMAR BERA (<i>Alternate</i>)
MRF Limited, Chennai	SHRI G. SHYJU DR P. INDUMATHI (<i>Alternate</i>)
Newage Fire Protection Industries Pvt Ltd, New Delhi	SHRI BHARAT J. SHAH SHRI JAYANT SINHA (<i>Alternate</i>)

<i>Organization</i>	<i>Representative(s)</i>
Rado Industries Limited, Faridabad	SHRI KAILASH GUPTA
Research, Designs & Standards Organization (RDSO), Lucknow	SHRI P. K. BALA SHRI MANOJ MINZ (<i>Alternate</i>)
Reliance Industries Ltd, Vadodara	SHRI R. C. GHOSH SHRI GAJENDRA INANI (<i>Alternate</i>)
Shri Sati Rubber Industries, Jaipur	SHRI VIJAY KUMAR AGARWAL SHRI SUDHIR AGARWAL (<i>Alternate</i>)
Voluntary Organization in Interest of Consumer Education (VOICE), New Delhi	SHRI M. A. U. KHAN SHRI H. WADHWA (<i>Alternate</i>)
United Planters Association of Southern India, Coonoor	SHRI SANTOSH KUMAR
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